

NAVAL AEROSPACE MEDICAL RESEARCH LABORATORY



SCIENCE UPDATE



NAMRL MISSION: TO CONDUCT RESEARCH, DEVELOPMENT, TESTING, AND EVALUATION IN AEROSPACE MEDICINE AND RELATED SCIENCES TO ENHANCE THE HEALTH, SAFETY AND OPERATIONAL READINESS OF NAVY, MARINE CORPS, AND OTHER MILITARY PERSONNEL.

FALL 2009

NAMRL HOSTS INAUGURAL RESEARCH SHOWCASE



The past year has seen a surge in research activity and productivity at NAMRL. The fruits of this activity were put on display to research sponsors and customers at the inaugural "NAMRL Research Showcase", held July 27th at the lab onboard NAS Pensacola. The purpose of the event was to showcase NAMRL's aeromedical research capabilities to current and potential sponsors and customers, and to develop and strengthen these relationships, ultimately with an eye to maintaining and improving the lab's focus on conducting fleet-relevant aeromedical research. Leaders from NAVAIR, Office of Naval Research, Naval Aviation Schools Command, School of Aviation Safety, Naval Operational Medicine Institute, Naval Medical Research Center, Naval Aerospace Medical Institute, and DUSD (Science and Technology), among oth-

ers were in attendance.

The NAMRL Officer in Charge (OIC) welcomed guests and began the day with an overview of the mission and capabilities of the lab. The morning session consisted of several briefs and demonstrations by NAMRL researchers. One of NAMRL's principal investigators discussed the lab's hypoxia research program and provided a demonstration of the lab's hypoxia research capabilities, including the Reduced Oxygen Breathing Device (ROBD), which was developed at NAMRL in the late 1990s. Also provided was an overview of a recent sleep restriction study validating several physiological and psychological measures for the assessment of readiness to fly among Naval aviators. The presentation included a tour of NAMRL's portable Fatigue Lab. An overview was provided of the operational stress and resilience program, highlighting recent projects investigating mechanisms of stress response in high-stress military environments. The OIC provided a demonstra-

tion of NAMRL's Enhanced Spatial Disorientation Training (ESDT) software, revolutionary new multimedia courseware that NAMRL recently delivered to Naval Aviation Schools Command. This courseware is highly interactive and is presented in a modular format, enabling brief targeted training on specific SD topics. The courseware will replace outdated and inaccurate spatial disorientation training materials. Other presentations at the showcase described work in the areas of motion sickness, personnel selection, vestibular science, and pharmaceutical fatigue countermeasures.

The morning session was concluded with an overview of NAMRL's planned move in 2011 to Wright-Patterson AFB, after which visitors enjoyed lunch with NAMRL scientists at the Cubi Point Bar and Grill at the National Museum of Naval Aviation.

The afternoon session provided opportunities for NAMRL researchers to

meet individually with current and prospective funding sponsors. In the end, the event provided an excellent forum for NAMRL to educate sponsors and customers about the lab's unique aeromedical research capabilities. This purpose was successfully accomplished, ensuring the laboratory is aligned now and in the future with both fleet aeromedical requirements and Navy R&D research priorities.

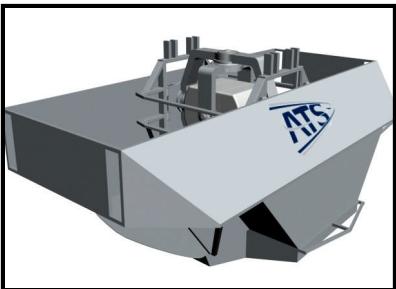


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BRAC UPDATE

Construction of the future home of NAMRL (NAMRU-Dayton) is well underway and remains ahead of the original scheduled completion date. In parallel, a new Disorientation Research Device (DRD) is being fabricated which will be integrated into the new building. This state-of-the-art device will



Artist Rendition of the Disorientation Research Device



Future Location of the Disorientation Research Device

consist of a four degrees-of-freedom capsule mounted on a horizontal track and will be a key building block for future research programs. 27 August 2009 marked a critical MILCON milestone with the successful pouring of the support slab and mounting of the foundation fixture for the DRD. This event was considered the most critical step in the process of device integration into the building. The DRD contractor has completed preliminary designs and is developing critical designs to finalize the device/MILCON integration requirements. A comprehensive Transition Plan has been developed to ensure a systematic approach to this multi-dimensional task.

Building occupancy is scheduled for May 2011 and the majority of personnel moves are anticipated to occur in summer 2011. Efforts to lay the foundation for a seamless transfer of our research programs to Dayton have been extremely successful. NAMRL is currently pursuing scientific collaborations with the University of Dayton Research Institute,



Artist rendition of NAMRU-Dayton



Current progress (SEP 2009) of NAMRU-Dayton

Wright State University, the newly established Air Force Human Performance Wing and the Air Force Research Institute. In addition, we have integrated our BUMED, Office of Naval Research, and Naval Air Systems Command research sponsor into the process to ensure the continuity of critical funding for mission essential research programs.

VECTION THRESHOLDS RELATE TO COLOR CONTRAST

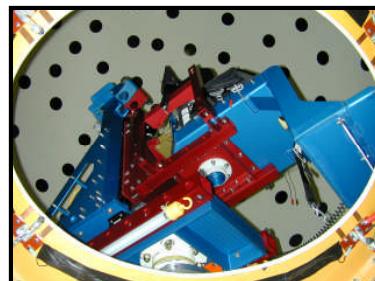


VVSD

Vection is a sensory-spatial illusion that creates false sensations of self-motion in either linear or angular directions. Although false percep-

tions of self-motion are common, visual characteristics linked to this type of illusion are not fully understood. Vection can be strongly influenced by various physical aspects, such as optical velocity of the visual stimulus, spatial frequency, and field of view. A NAMRL study was conducted to determine color saturation threshold levels necessary for inducing vection. The Visual Vestibular Sphere Device (VVSD) was used to elicit the illusion of self-

motion (vection) while subjects viewed the moving VVSD surround through a window that allowed variations in visual contrast; this method led to the determination of contrast thresholds for the detection of surround motion and the onset of vection.



Inside of the VVSD

ASSESSING AIRCREW READINESS TO FLY



NAMRL scientists conducted validation analyses for potential “readiness to fly” assessment tools predicated on detecting operationally relevant cognitive performance deficits due to fatigue. The Naval Safety Center (NSC) has identified the need for a quickly-administered cognitive performance assessment tool to determine a pilot or aircrew member’s readiness to fly. To fulfill that request, NAMRL has evaluated several tools to detect impairment due to fatigue, specifically, Flight Fit and the PMI Fit 2000. Flight Fit is a brief computer-based

cognitive evaluation to determine pilots’ abilities, composed of tasks that are sensitive to the effects of fatigue, while the PMI Fit 2000 uses eye-tracking and pupillometry to perform a 30-second assessment of impairment due to fatigue. NAMRL also included an evaluation of performance on several other vigilance, cognitive, flight simulation and subjective tasks. Preliminary results from this study represent a significant step toward identifying efficient tools to detect impairment due to fatigue in Naval Aviation and will provide guidance about the utility

of transitioning these tools to the fleet via the NSC. It is anticipated that the tools deemed effective in accurately detecting fatigue will be used for a variety of purposes, to include the establishment of individual pilot physiological/performance baselines for subsequent use in pre-flight readiness assessments, and as a repository of physiological readiness data for use in mishap investigations. This information will be used to inform future standards or policy related to crew day, crew rest, scheduling, and other operational requirements.

COMMANDER'S CORNER



One of my top priorities is to ensure that our research staff is engaged with Line and medical customers, as well as R&D sponsors, to layout a research road map that is compatible with fleet needs and R&D priorities. To facilitate this goal, NAMRL invited leadership from a variety of military establishments, such as NASC, NOMI, NAMI, NMRC, NAVAIR, OSD, ONR, the Rescue Swimmer School, and the ASO School, for a scientific showcase, to convey the redefined and newly established core capabilities of the laboratory. The event included an overall laboratory and science mission overview, scientific presentations, poster session, live demonstrations, laboratory tours and BRAC briefing. A no-host lunch and afternoon breakout sessions allowed for direct idea exchange between NAMRL leadership, scientists, and customers. Attendees

were also given copies of tech reports, manuscripts, and a CD outlining each scientific project. The day's events provided numerous opportunities for our customers and sponsors to better understand the breadth and depth of NAMRL research, and to allow for discussions to ensure our research is aligned with fleet needs and with Navy R&D priorities. Our collaborators' willingness to team with NAMRL researchers on overlapping interest areas is critical for NAMRL's relevancy in the aviation world. The showcase goals of fleet and sponsor education and interface were achieved and the interaction will undoubtedly improve the quality and relevance of future research conducted at NAMRL. Another goal of the showcase was to provide a BRAC overview and the strategic plan for science success during the transition to Dayton, OH. Customers and sponsors were impressed with the well-thought-out plan presented by the NAMRL BRAC team, and attendees expressed confidence that NAMRL could stay viable, relevant, and solvent during the transition, as well as after the move to Dayton. In the coming months, NAMRL will continue active coordination with the fleet via our newly established NMR&D Fleet Liaison for Aviation. The Liaison role will allow synergies to develop as new operational problems are conveyed from the fleet to the R&D labs. In turn, the Liaison will represent Navy Medicine R&D's considerable experience and resources back to the stakeholders in new and innovative ways. The future at NAMRL looks bright as our research moves more in line with fleet needs, our products aim to support and enhance our warfighters' effectiveness and survivability, and we are moving into a state-of-the-art research laboratory with world-class capabilities.